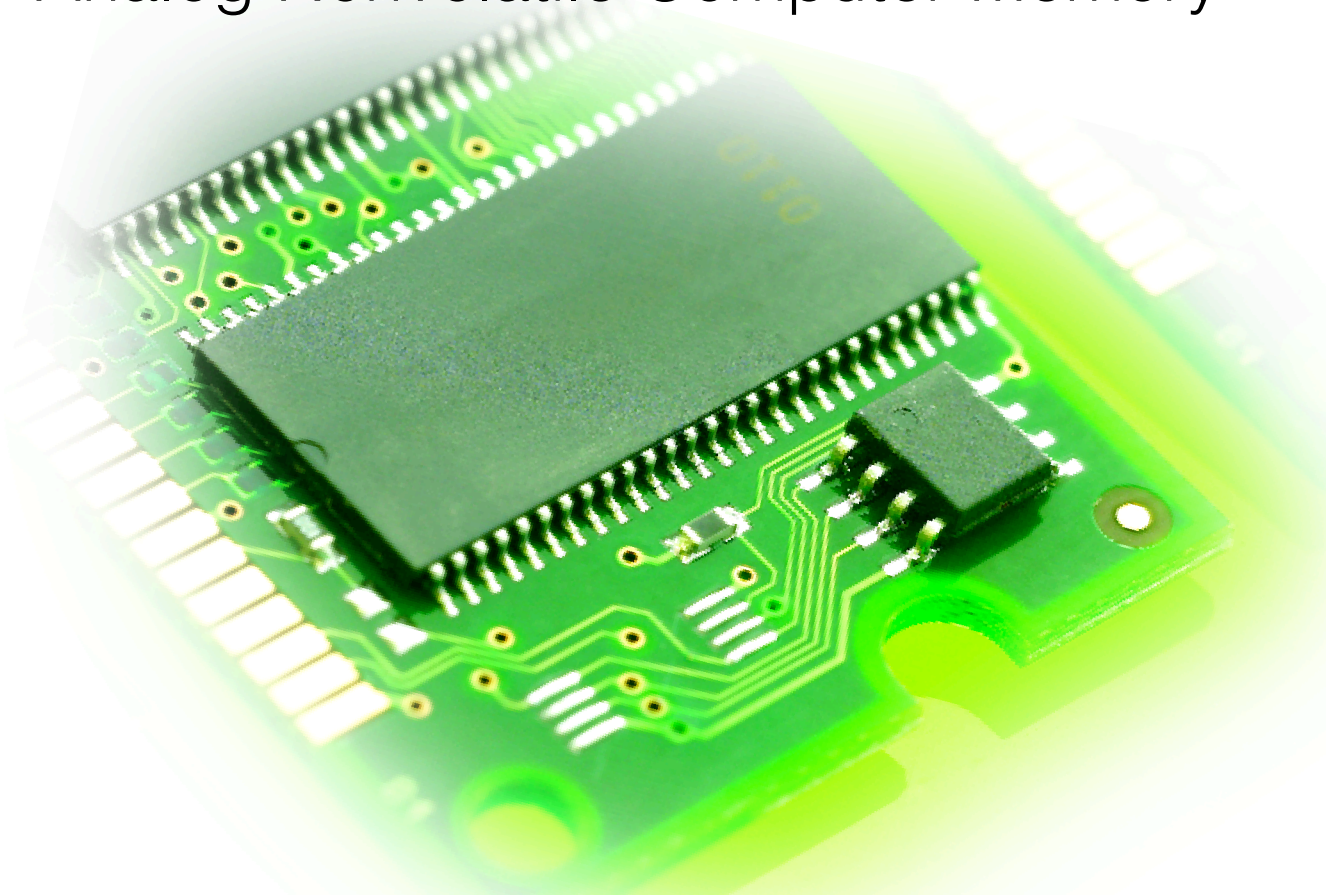
**Computer Memory Technology**

# Analog Nonvolatile Computer Memory

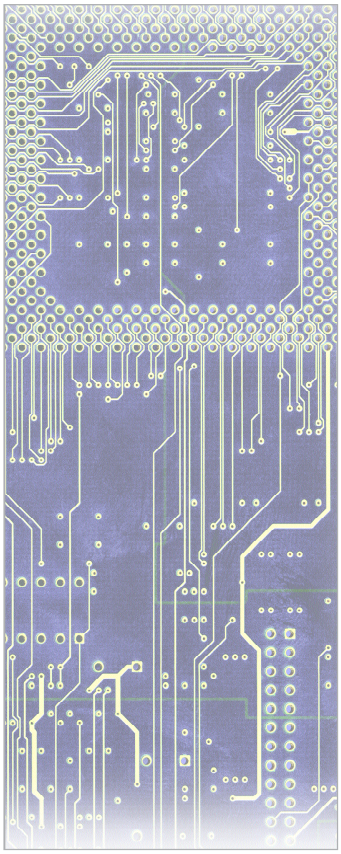


technology opportunity

Developed at NASA Marshall Space Flight Center (MSFC), this technology is an entirely new method for storing and retrieving electronic data. The device described is used to store digital computer information as an analog signal on a ferroelectric transistor (FeFET). It is a significant improvement over the current standard Flash and CMOS memory technologies and could potentially become an industry standard for computer memory.

## Benefits

- Allows for a higher memory density – 24-fold increase in memory density compared to CMOS.
- Eight bits of information per two ferroelectric transistors – CMOS memory uses six transistors to store a single bit of information.
- Read/write cycle in nanoseconds – faster than FLASH or EEPROM.
- Less susceptible to radiation damage – improvement over standard flash memory or CMOS memory.
- Retains data without power – older ferroelectric random access memory (FRAM) loses data without power.
- Unlimited read/write cycles – Flash memory typically allows on the order of 10K cycles. The primary market is in the field of computers and electronic memory. This technology is a major leap forward and is superior to EEPROM and Flash memory.



## For More Information

If you would like more information about this technology or about NASA's technology transfer program, please contact:


**Sammy Nabors**

NASA Marshall Space Flight Center
Technology Commercialization Manager
Phone: (256) 544-5226
Fax: (256)-544-4810
E-mail: sammy.nabors@nasa.gov

**Tom Coleman**

NASA Marketing Manager
National Technology Transfer Center
Phone: (304) 243-4419
Fax: (304) 243-4384
E-mail: tcoleman@nttc.edu


www.nasasolutions.com

## The Technology

This technology emerged from research into ferroelectric devices, specifically Fe capacitors. The device stores digital computer information as an analog signal on a ferroelectric transistor that allows the data to be retrieved even after power is removed from the device. This is an improvement of Ferroelectric Random Access Memory (FRAM). The device stores many bits of data on two transistors instead of the normal 6 transistors for one bit. It can read and write this data at high speed with an unlimited number of cycles. The data is retained for long periods of time without power.

The memory design will be useful because it allows higher memory density, compensates for the environmental and ferroelectric aging processes, allows analog values to be directly stored in memory, is resistant to degradation from environmental and radiation exposure, and relies on commercially available technologies.

## Partnering Opportunities

This technology is part of NASA's technology transfer program. The program seeks to stimulate development of commercial uses of NASA-developed technologies. NASA is flexible in its agreements, and opportunities exist for licensing and joint development. MSFC has developed a prototype that functions as defined and is interested in a partnership to commercialize the technology.

## Commercial Applications

The primary market is in the field of computers and electronic memory. This technology is a major leap forward and is superior to EEPROM and Flash memory.


NP-2006-09-134-MSFC

MFS-32208-1